WHAT IS CLAIMED IS:

1. An exhaust gas purifying apparatus for an internal combustion engine, comprising:

an NOx removing catalyst that absorbs nitrogen oxides in an exhaust gas of the engine when an air-fuel ratio of the exhaust gas streaming thereinto is lean and that releases and reduces the absorbed nitrogen oxides therefrom when the air-fuel ratio of the exhaust gas streaming thereinto is rich;

an exhaust gas atmosphere varying section that varies a ratio between an oxidizing agent in the exhaust gas and a reducing agent therein;

a first exhaust gas atmosphere detecting section disposed in an upstream side of an exhaust passage with respect to the NOx removing catalyst to detect the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein;

a second exhaust gas atmosphere detecting section disposed in a downstream side of the exhaust passage with respect to the NOx removing catalyst to detect the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein;

an abnormality determining section that executes an abnormality determination of the NOx removing catalyst on the basis of output values of both of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section from a time at which the output value of the first exhaust gas atmosphere detecting section is varied to a first predetermined value to a time at which the output value of the second exhaust gas atmosphere detecting section is reached to a

second predetermined value when the exhaust gas atmosphere varying section increases the ratio of the reducing agent in the exhaust gas.

2. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 1, wherein the abnormality determining section calculates an integration quantity with respect to time of a difference between the output values of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section and executes the abnormality determination of the NOx removing catalyst on the basis of the calculated integration quantity of the difference.

3. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 1, wherein each of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section detects an oxygen concentration in the exhaust gas.

4. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 1, wherein each of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section detects an air-fuel ratio of the exhaust gas.

5. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 4, wherein the abnormality determining section calculates an extra HC quantity in the exhaust gas on

the basis of the detected exhaust gas air-fuel ratio and an intake fresh air quantity and wherein the abnormality determining section executes the abnormality determination of the NOx removing catalyst on the basis of an integration quantity with respect to time of a difference between the extra HC quantity in the exhaust gas at the upstream side of the exhaust passage with respect to the NOx removing catalyst and the extra HC quantity in the exhaust gas at the downstream side of the exhaust passage with respect to the NOx removing catalyst.

6. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 1, wherein the abnormality determining section suspends the abnormality determination of the NOx removing catalyst when the difference of the output values of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section is larger than a third predetermined value when the output value of the second exhaust gas atmosphere detecting section is reached to the second predetermined value.

7. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 3, wherein the first exhaust gas atmosphere detecting section comprises an upstream side oxygen concentration sensor disposed at the upstream side of the exhaust passage with respect to the NOx removing catalyst and the second exhaust gas atmosphere detecting section comprises a downstream side oxygen concentration sensor disposed at the downstream side

of the exhaust passage with respect thereto and wherein the abnormality determining section executes the abnormality determination of the NOx removing catalyst for an interval of time at which the output value of the downstream side oxygen concentration sensor is maintained within a predetermined range in the vicinity to a stoichiometric air-fuel ratio when the exhaust gas atmosphere varying section increases the ratio of the reducing agent in the exhaust gas .

8. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 7, wherein the abnormality determining section comprises: an integration quantity calculating section that calculates an integration quantity (KOBDO2) with respect to time of a difference between output voltages of the downstream side oxygen concentration sensor and the upstream side oxygen concentration sensor (VO2_R-VO2_F) as follows: $KOBDO2 = KOBDO2_{n-1} + (VO2\_R - VO2\_F)$, wherein n denotes an arbitrary integer and $KOBDO2_{n-1}$ is a previous value of KOBDO2.

9. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 8, wherein the abnormality determining section comprises: an NOx release end determining section that determines whether an interval of time during which the downstream side exhaust gas air-fuel ratio is maintained in the vicinity to the stoichiometric air-fuel ratio is ended; and an absolute value of difference calculating section that determines whether an absolute value of the difference between

the output voltages of the upstream side oxygen concentration sensor and of the downstream side oxygen concentration sensor is equal to or lower than a third predetermined value (KDVO2#) when the NOx release end determining section determines that the interval of time is ended.

10. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 9, wherein the abnormality determining section defines the calculated integration quantity (KOBDO2) as a final oxygen concentration sensor output voltage value (KOBDF1) for the abnormality determination and clears the calculated integration quantity when the absolute value of difference calculating section determines that the absolute value of the difference between the output voltages of the upstream side oxygen concentration sensor and of the downstream side oxygen concentration sensor ($|VO2\_F - VO2\_R$) is equal to or lower than the third predetermined value (KDVO2#) and determines whether the final oxygen concentration sensor output voltage value (KOBDF1) is larger than at least one predetermined abnormality determined threshold value (KOBDFSL1#1) to determine whether the abnormality of the NOx removing catalyst is present.

11. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 9, wherein, when the absolute value of difference calculating section determines that the absolute value of the difference between the output voltages of the upstream side and downstream side oxygen

concentration sensors (|VO2_F - VO2_R|) is larger than the third predetermined value (KDVO2#), the abnormality determination by the abnormality determining section is suspended.

12. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 4, wherein the first and second exhaust gas atmosphere detecting sections comprise an upstream side λ sensor and a downstream side λ sensor, respectively, and wherein the exhaust gas purifying apparatus further comprises an excess air ratio calculating section that calculates an upstream side excess air ratio (RLAMB_F) at the upstream side of the exhaust passage with respect to the NOx removing catalyst on the basis of a pump current value of the upstream side λ sensor disposed at the upstream side of the exhaust passage with respect to the NOx removing catalyst and calculates a downstream side excess air ratio (RLAMB_R) at the downstream side of the exhaust passage with respect to the NOx removing catalyst on the basis of the pump current value of the downstream side λ sensor disposed at the downstream side of the exhaust passage with respect to the NOx removing catalyst.

13. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 12, wherein the abnormality determining section comprises an integration quantity calculating section that calculates an integration quantity (KOBDRLAMB) with respect to time of a difference between the

downstream side excess air ratio (RLAMB_R) and the upstream side excess air ratio (RLAMB_F) as follows: $KOBDRLAMB = KOBDRLAMB_{n-1} + (RLAMB\_R - RLAMB\_F)$, wherein n denoted an arbitrary integer and $KOBDRLAMB_{n-1}$ denotes a previous value of KOBDRLAMB.

14. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 13, wherein the abnormality determining section comprises: an NOx release end determining section that determines whether an interval of time during which the downstream side excess air ratio is maintained in the vicinity to the stoichiometric air-fuel ratio is ended; and an absolute value of difference calculating section that calculates an absolute value of a difference between the excess air ratio of the upstream side λ sensor and the excess air ratio of the downstream side λ sensor falls within the second predetermined value (KDRLAMB#) when the NOx release end determining section determines that the interval of time is ended.

15. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 14, wherein the abnormality determining section defines the calculated integration quantity (KOBDRLAMB) as a final excess air ratio integration value (KOBDF2) for the abnormality determination of the NOx removing catalyst and clears the calculated integration quantity and determines whether the final excess air ratio integration value (KOBDF2) is larger than at least one predetermined abnormality determination

threshold value (KOBDFSL2#) to determine whether the abnormality of the NOx removing catalyst is present.

16. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 5, wherein the cylinder intake fresh air quantity (Qac) is determined as follows:
Qac = Qac(n-1) x (1 - KVOL x Kin) + Qasn x KVOL x Kin,
wherein KVOL denotes a cylinder volume ratio, Kin denotes a volumetric efficiency corresponding value, and Qasn denotes an engine collector inlet fresh air rate and the first exhaust gas atmosphere detecting section comprises an upstream side λ sensor and the second exhaust gas atmosphere detecting section comprises a downstream side λ sensor and an extra reducing agent quantity (HC quantity) is determined on the basis of an excess air ratio of the upstream side λ sensor (RLAMB_F), the excess air ratio of the downstream side λ sensor (RLAMB_R), and the cylinder intake air fresh air rate (Qac) as follows: HC (quantity)= Qac/(BLAMB# x RLAMB), wherein BLAMB# denotes a predetermined coefficient, RLAMB = RLAMB_F in a case of the upstream side λ sensor and RLAMB = RLAMB_R in the case of the downstream side λ sensor and an upstream side HC quantity HC_F and a downstream side HC quantity HC_F are calculated from a weighted mean processed calculated upstream side HC (quantity) and from a weight mean processed calculated downstream side HC (quantity), respectively.

17. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 16,

wherein the abnormality determining section comprises an integration quantity calculating section that calculates an integration quantity with respect to time (KOBDHC) of a difference between the downstream side HC quantity (HC_R) and the upstream side HC quantity (HC_F) as follows: $KOBDHC = KOBDHC_{n-1} + (HC\_R - HC\_F)$, wherein n denotes an arbitrary integer and $KOBDHC_{n-1}$ denotes a previous value of KOBDHC.

18. An exhaust gas purifying apparatus for an internal combustion engine as claimed in claim 17, wherein the abnormality determining section comprises: an NOx release end determining section that determines whether an interval of time during which the downstream side excess air ratio is maintained in the vicinity to the stoichiometric air-fuel ratio is ended; and an absolute value of difference calculating section that calculates an absolute value of a difference between the HC quantity at the upstream side λ sensor and the HC quantity at the downstream side λ sensor falls within the second predetermined value (KDRLAMB#) when the NOx release end determining section determines that the interval of time is ended.

19. An exhaust gas purifying apparatus for an internal combustion engine, comprising:

NOx removing catalyst means for absorbing nitrogen oxides in an exhaust gas of the engine when an air-fuel ratio of the exhaust gas streaming thereinto is lean and that releases and reduces the absorbed nitrogen oxides therefrom when the air-fuel ratio of the exhaust gas streaming thereinto is rich;

exhaust gas atmosphere varying means for varying a ratio between an oxidizing agent in the exhaust gas and a reducing agent therein;

first exhaust gas atmosphere detecting means disposed in an upstream side of an exhaust passage with respect to the NOx removing catalyst means for detecting the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein;

second exhaust gas atmosphere detecting means disposed in a downstream side of the exhaust passage with respect to the NOx removing catalyst means for detecting the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein; and

abnormality determining means for executing an abnormality determination of the NOx removing catalyst means on the basis of output values of both of the first exhaust gas atmosphere detecting means and the second exhaust gas atmosphere detecting means from a time at which the output value of the first exhaust gas atmosphere detecting means is varied to a first predetermined value to a time at which the output value of the second exhaust gas atmosphere detecting means is reached to a second predetermined value when the exhaust gas atmosphere varying means increases the ratio of the reducing agent in the exhaust gas.

20. An exhaust gas purifying method for an internal combustion engine, the internal combustion engine comprising an NOx removing catalyst that absorbs nitrogen oxides in an exhaust gas of the engine when an air-fuel ratio of the exhaust gas streaming thereinto is lean and that releases and

reduces the absorbed nitrogen oxides therefrom when the air-fuel ratio of the exhaust gas streaming thereinto is rich;

providing an exhaust gas atmosphere varying section that varies a ratio between an oxidizing agent in the exhaust gas and a reducing agent therein;

providing a first exhaust gas atmosphere detecting section disposed in an upstream side of an exhaust passage with respect to the NOx removing catalyst to detect the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein;

providing a second exhaust gas atmosphere detecting section disposed in a downstream side of the exhaust passage with respect to the NOx removing catalyst to detect the ratio between the oxidizing agent in the exhaust gas and the reducing agent therein; and

executing an abnormality determination of the NOx removing catalyst on the basis of output values of both of the first exhaust gas atmosphere detecting section and the second exhaust gas atmosphere detecting section from a time at which the output value of the first exhaust gas atmosphere detecting section is varied to a first predetermined value to a time at which the output value of the second exhaust gas atmosphere detecting section is reached to a second predetermined value when the exhaust gas atmosphere varying section increases the ratio of the reducing agent in the exhaust gas.